

of *Limnophora exsurda* Pand. was added by me to the British List, by accepting as correct the identification of the species by Schnabl in 1911, and Stein in 1916. He further pointed out that Dr Lyneborg agreed that Hennig in Lindner's 'Die Fliegen' had described (and figured the male genitalia) of the species Schnabl, Stein, and Collin had incorrectly recognized as *exsurda*, under the incorrect name of *setinerva* S. & D., making it necessary for him to give a new name to Hennig's species. Apparently Hennig made this mistake because Villeneuve had accepted this synonymy as correct, in spite of the fact that Schnabl's description and genital figures were obviously those of a different species.

At that time Hennig and Lyneborg considered Pandellé's *exsurda* an unrecognizable species, but Lyneborg (apparently unknowingly) had made its identity practically certain by publishing figures of the male genitalia of *setinerva*, and of the actual type specimens of *variabilis*, *uniseta*, and *scrupulosa*, and those of *variabilis* were exactly the same as those figured by Schnabl for his *exsurda* var *lativittata*, a name which has never been validated by acceptance as the name for a species. Schnabl's *exsurda* was, of course, *olympiae*, which though having a mesolobe very like that of *C. riparia* Fln. (as in the case of Pandellé's *exsurda* and *variabilis*) had setulae on the basal part of the cubital vein, absent in the latter two species, neither of which has been found in Britain, both being found on high mountains in Central Europe, and *variabilis* according to Stein attracted to the flowers of Umbelliferae, exactly in both ways as recorded by Pandellé for *exsurda*. Surely it is impossible for these to be two different species, and *exsurda* is the older name. This new synonymy should be noted.

Pandellé lived in Tarbes, a very ancient city built in a fertile plain on the south side of part of the Pyrenees, and it was in the mountains there that most of his collecting was done, and where he found his species *exsurda* freely from June until October, making it incredible that there should be no specimens in his Collection. He died in 1906, and his Collection ultimately reached Paris, where it became easily available to anyone interested. The inability to find specimens of *exsurda* in that Collection may have been due to a shaking loose of them, or their name label, in the journey from Tarbes, and their subsequent misplacement. Otherwise someone must have been responsible for misplacing them. What now appears necessary is that someone should collect specimens in the same locality, and one of them be selected as a 'neotype'.

Raylands, Newmarket, Suffolk. 6.viii.66.

Asilidae (Dipt.) of Northern England

By P. SKIDMORE, F.R.E.S.

It is a curious fact that no Asilid could be mistaken for a member of any other Dipterous family, so distinct is the Asilid stamp on all its members not only in Britain but throughout the world. They are chiefly recognised by their carnivorous habits, their strong probosces and their characteristic wing venations. Their predatory nature has earned for them the common name of Assassin or Robber flies.

Included in this interesting group of insects are some of the largest and most striking of all known Diptera. In Britain our two largest species: *Asilus crabroniformis* L. and *Laphria flava* (L.) are upwards of

one inch in length and of very majestic appearance. A third species, *Pamponerus germanicus* (L.), may attain almost the same dimensions and is no less striking.

The biology of some Swedish members of this family formed the subject of a monumental work by Melin (1923), and since most of our species are also found in Sweden, this work should have prior place on the bookshelves of all British dipsterists who have an interest in this family.

Melin provides keys to the determination of Asilid larvae and pupae, and also gives very extensive biological data on all stages of development.

OVIPOSITION

In the Asilidae there is considerable diversity of habit in the process of egg laying. In *Leptogaster* and *Dioctria* the eggs are merely dropped from the vegetation. The *Laphria* species insert their eggs in crevices in the bark of dead trees or in the exit holes of lignicolous insects. Several of the Asilinae insert their eggs in crevices in plants. *Eutolmus* cuts a fissure with the ovipositor in the leaf sheaths of various grasses; *Dysmachus* inserts them into grass spikelets; *Machimus* and *Epitriptus* lay them in various similar situations; *Neoitamus* ova are inserted in buds at the apices of lower branches of trees, while *Rhadiurgus* eggs are attached to moss stems. *Asilus* appears to be the only British species which lays in cowdung, the rest of our species laying on the ground. The oviposition methods of the sand dune species are most interesting. *Philonicus* and *Lasiopogon* females have comb-like structures on the ovipositor. With these the fly scoops out a small hole in the sand, inserts the egg and then brushes the sand back. *Pamponerus* lacks the comb and merely scatters the eggs broadcast on the sand, and they are thus open prey for various small carabids which feed mainly on fly eggs.

The eggs themselves are very variable in size and shape, *Leptogaster* being broad oval and about 0.43 mm. long. In *Laphria*, *Dioctria* and *Lasiopogon*, they are more or less oval, while in the Asilinae they are elongate, most markedly so in *Eutolmus* where they are three times as long as broad (1.27 × .42 mm.). As in other families of flies (i.e. Muscidae), the size of the egg is partly governed by the number laid. In *Laphria gibbosa*, for instance, the female lays more eggs than does *L. flava*, and consequently the eggs of *gibbosa* are much smaller than in *flava* although the flies themselves are larger.

LARVAE

Asilid larvae are very easily recognised by their well-developed retractile head and the pronounced ampullae on abdominal segments 1 to 6 or 7. These ampullae are contractile, ambulatory in function, and are in pairs on the dorsal and ventral surfaces of the segments. Lateral callosities are also present on the same abdominal segments. The eighth abdominal segment bears the anal spiracles and the ninth segment is characteristically well-developed. It is a curious fact that Asilid larvae, like adults, bear a very strong family stamp which makes their recognition a relatively simple matter. No known Asilid larva could be mistaken for that of any other family.

All known Asilid larvae develop either in sandy or light soils, or, as in the Laphriinae, in rotten wood. For long there has been much con-

trovery on the subject of larval nutrition. While *Laphria* larvae and others are often found devouring larvae of other insects, Melin is of the opinion that such occurrences are purely accidental and that Asilid larvae are essentially saprophagous. As Melin points out, a *Laphria* larva proceeding along a tunnel made by a Cerambycid larva and catching up with the excavator itself, is faced with three choices. Either it can stop and wait, turn round and retrace its path, or carry on and bore through the unfortunate beetle larva. The last choice is quite as acceptable as the other two to the *Laphria*. That *Laphria* larvae are not essentially carnivorous, is shown by the fact that several can live quite amicably in a box of loose chips of rotten wood. Also, they may breed in rotten wood long since vacated by longhorns or other large lignicolous insects. Asilid larvae then, like many dipterous larvae, may be looked upon as saprophagous or, at most, facultative carnivores.

PUPAE

Typical of the primitive groups of Diptera, the pupae of Asilids are free, the final instar larva completely shedding its skin during pupation. Asilid larvae may live for several years, but the pupal stage is of very short duration, lasting for only a week or two. The pupae are tolerably easy to determine, using Melin's work.

ADULTS

Asilids, as said, are amongst the most interesting of insects, and, because of their often large size and extreme alertness, they make ideal subjects for behavioural studies. The author has watched *Laphria flava* in the Speyside forests on many occasions and found such pastimes most rewarding. This fly has extremely acute vision up to about a yard, and can see movements over much greater distances. On one occasion a *Laphria* was watched as he hunted from a pine stump. Constantly he sprang this way and that, his head in constant motion, watching every moving thing. When seeds were flicked past him, his head turned and clearly his attention was fixed, but he did not rise to give chase. As soon as an insect passed at the same distance, however, he was in lightning pursuit, returning just as quickly with his "booty", which he proceeded to suck. Even during the meal, however, his attentions were on everything that passed.

Melin gives extensive data on behaviour patterns of the Swedish Asilids, and his findings explain many of the curious habits of these insects. For instance, the head turning of the *Laphria* just mentioned, is explained when one realises that the fly obtains the best definition through the enlarged front facets. Thus, if the fly sees a movement behind him, through the small outer peripheral facets, he swings round to face the disturbance to obtain the best possible view of it. If the movement interests him, he pursues it. The grass seeds thrown past him at a yard's distance didn't fool him since he could tell the difference between a seed and a fly at that distance.

Not all Asilids have good vision, the species of *Leptogaster* having very mediocre eyesight, although paradoxically these flies are the sparrowhawks of the fly world, hunting in flight. *Dioctria* have slightly better sight, and these hunt both on the wing and from leaves, etc.

Asilids take at least a year to develop in Europe, so there is only one generation annually, but an individual adult of some species may live

several weeks. This in part accounts for the long flight period of some Assassin flies (*Philonicus*, for instance). Another contributory factor is the very staggered emergence, newly emerged adults being met with throughout the flight period, which in *Philonicus* extends from early July to October.

While few of our native Asilids are very rare, none is common everywhere throughout the whole country as is the Common Yellow Dung fly (*Scatophaga stercoraria* L.) for instance. This fly is predacious in the adult stage but there all similarity ends. It has several generations annually and has only one major requirement—a good supply of cow dung wherein to develop. Our commonest Asilid (*Dioctria rufipes* Deg.) on the other hand, has only one generation annually, and has many requirements, not the least of which is a light soil. This strong preference for light soil is shared by all terrestrial Asilid larvae, so it is not surprising that the family is poorly represented in those regions where the soil is of a heavy loamy, clayey, or peaty nature. Conversely, the association of Asilidae with light sandy or basic soils is only to be expected.

In the present paper and subsequent ones on the flies of northern England, the area under discussion is from Lincolnshire, Nottinghamshire, Derbyshire and Cheshire northwards to the Scottish border. Records have been collected from the following main sources:—

Lincolnshire—J. H. White, 1945. Preliminary List of Diptera of Lincolnshire. *Lincs. Nats. Soc. Trans.*

W. J. Fordham's Card Index of British Diptera records. (In the possession of the Yorkshire Naturalists Union.)

Nottinghamshire—"The Invertebrate Fauna of Nottinghamshire", by L. W. Carr.

Derbyshire—W. J. Fordham's card index (see above).

Cheshire—Diptera card index at Manchester Museum.

Lancashire—Diptera card index at Manchester Museum.

Westmorland—Manchester and Carlisle Museum Collections.

Durham—W. J. Fordham's card index (see above).

Northumberland—W. J. Fordham's card index (see above).

Cumberland—Manchester and Carlisle Museum Collections.

Isle of Man—Manchester Museum Collections.

Yorkshire—W. J. Fordham (above) and C. A. Cheetham's list.

The Isle of Man and Cumberland are virtually unworked, and the same may be said to a slightly lesser degree of Northumberland and Lincolnshire. Even Yorkshire has not been nearly so well worked as Cheshire and the southern half of Lancashire. Manchester has long been a centre of entomological activity in the north, and consequently the environs of that great city have been more extensively studied than perhaps any other part of northern England.

The British Isles has perhaps the poorest Asilid fauna of any country in Europe, barring of course Iceland where the family is totally absent. They generally prefer warmer, drier climates than ours. In Finland 33 species are recorded (Frey, 1941), while in Sweden there are "some 40 species" (Melin, 1923). Germany has well over 100, while France has nearly 150 (Seguy, 1927). In Britain 27 species are at present on the list, but Verrall (1909) mentioned 21 extra ones as "Reputed British species."

The Asilidae is one of the better known dipterous families, so we can

say with some degree of certainty which species do not occur in northern England. At least one unrecorded species, however (*Dioctria cothurnata* Mg.) could be reasonably expected, since it is known from southern England and several places in Scotland.

The following additional species on the British list (Kloet & Hincks, 1947) are not known to occur in northern England:—

Stenopogon (= *Selidopogon*) *diadema* (F.) This large striking black and white fly has only been recorded from Wales and Somerset (Verrall, 1909).

Laphria flava (L.) This magnificent fly in Britain is a denizen of the Caledonian pine forests, occurring in Moray, Inverness-shire, Banff, Aberdeenshire and Kincardineshire (Verrall, 1909, etc.).

L. gilva (L.) Another very fine insect, this only occurs in the pine woods on the heaths of west Surrey and adjacent parts of the neighbouring counties (Blair, 1938).

Rhadiurgus variabilis (Zett.) Was recorded erroneously by H. Britten from Delamere Forest (Cheshire) (Kidd & Brindle (1959)). Britten's specimens under that name in the collection of the Manchester Museum, were merely *Lasiopogon cinctus* (F.) *R. variabilis* in Britain has a distribution very similar to that of *Laphria flava*, being only known in the Caledonian pine forests of north-east Scotland (Verrall, 1909).

Machimus rusticus (Mg.) A rare species occurring on downland from Sussex to Gloucestershire and the Isle of Wight (Verrall, 1909).

Epitriptus arthriticus (Zetter) Only known from Norfolk (Hobby (1939)).

Neotamus cothurnatus (Mg.) This is extremely similar in general appearance to the *N. cyanurus* Fallen, but is only known from the counties of Berkshire and Oxfordshire where it occurs in one or two woodlands.

Abbreviations.—To save repetition of county and vice-county names, the following abbreviations have been adopted:—

Li—Lincolnshire (V.-c. 53, 54)

N—Nottinghamshire (V.-c. 56)

D—Derbyshire (V.-c. 57)

C—Cheshire (V.-c. 58)

SL—South Lancashire (V.-c. 59)

ML—Mid-Lancashire (V.-c. 60)

NL—North Lancashire (V.-c. 69, part)

W—Westmorland (V.-c. 69, part)

CU—Cumberland (V.-c. 70)

IM—Isle of Man (V.-c. 71)

ER—East Riding of Yorkshire (V.-c. 61)

WR—West Riding of Yorkshire (V.-c. 63, 64)

NR—North Riding of Yorkshire (V.-c. 62, 65)

Dm—County Durham (V.-c. 66)

Nd—Northumberland (V.-c. 67, 68)

Certain collectors' names have also been abbreviated. These are:—

EWA—E. W. Aubrook

TMC—T. M. Clegg

WGB—W. G. Bradley

HHC—H. H. Corbett

AB—A. Brindle

WJF—W. J. Fordham

CAC—C. A. Cheetham

WDH—W. D. Hincks

LNK—L. N. Kidd

KGP—K. G. Payne

BK—B. Kitchen

PS—P. Skidmore

CM—C. Morley

(to be continued)

Notes and Observations

ELATER SANGUINOLENTUS SCHR. (COL.).—The apparent absence of this interesting species from the Windsor Forest area, remarked on by Mr. Muggleton (*antea*: 185), is indeed rather strange in view of its occurrence so near as Chobham Common—a typical habitat where I too have taken it (one). It may perhaps exist very locally in Windsor Park on the Surrey side, but on the other hand quite suitable sandy or peaty (acid soil) areas with pine and birch—the latter, I think, generally a specific requirement—are scarcely to be found in the Park or Forest proper. Yet the species is recorded from Richmond Park, where the terrain is very similar to that at Windsor. What is certainly surprising is that Donisthorpe did not meet with it in the Ascot-Swinley area, which he considered as part of Windsor Forest; the former is typical Bagshot Sand country and *E. sanguinolentus* probably occurs there. It is however always very local, often extremely so, and can thus easily be missed.

A well-known locality for this beetle, from its proximity to London, is Wimbledon Common. Some of the early records mention it as taken there plentifully at times at roots of heather and at nettle bloom, and as attracted to flowering hawthorn. In March 1946 Mr. B. A. Cooper and I, working for the species on the Common, succeeded in turning it up after a short search at heather roots in what seemed a likely spot, but all subsequent specimens were under loose bark of old or rotting birch stumps particularly around the roots; larvae, which were more numerous, occurred in the same situation. The breeding-ground seemed very restricted. My series taken on this occasion, though small, shows a remarkably high incidence of variation (cf. Allen, 1948, *Ent. mon. Mag.*, **84**: 27). In later years I failed to find it again there, but I understand that it was taken last year on the Common.

My only captures of this attractive species, other than those already mentioned, have been by ones or twos near Woking, Surrey; at Fleet, Hants; and on Parley Heath, Dorset. On two occasions it was shaken from pine branches or trimmings lying on the ground, on the other found under a chip of bark on a birch stump. A favoured locality is the New Forest, where it has in certain years been beaten in abundance off young pines in May or June. Though it may sometimes breed in or at the roots of pine stumps, I believe that birch is more usually selected for the purpose.

It is possible that the frequent association of the insect with pine is due, in part at least, to a liking for the aphids of that tree as food (see, on this point, Mr. Muggleton's interesting observation). The male flowers of the pine may be a further attraction, but there is increasing evidence that adult Elaterids of several species take some insect food—a habit that may well be general in the family. *E. sanguinolentus* and *E. elongatulus*, among others, were observed feeding on tree aphids by H. Kawall as long ago as 1855 (*Stett. ent. Zeit.*, **16**: 228).—A. A. ALLEN, 63 Blackheath Park, S.E.3. 8.viii.1966.